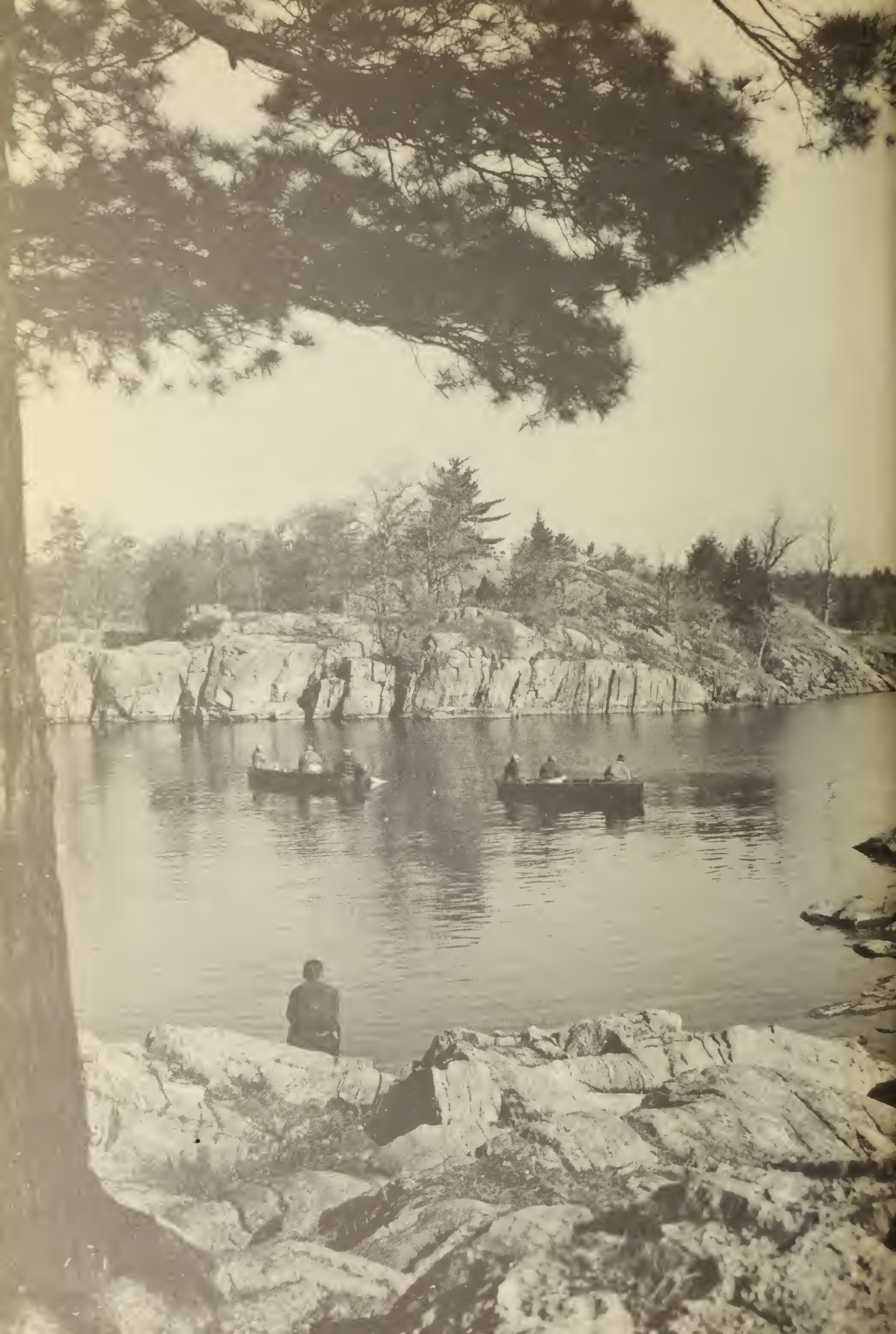


ONTARIO
FISH AND WILDLIFE
REVIEW

Vol. 5, No. 2 Summer, 1966



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DEPARTMENT OF LANDS AND FORESTS

HON. A. KELSO ROBERTS, Q.C., MINISTER G.H.U. BAYLY, DEPUTY MINISTER

ONTARIO
FISH AND WILDLIFE
REVIEW

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THE COVER

Fish may not be at their bitingest in summer, but it's the best season for angling, in the opinion of many outdoorsman including the two found on Wabaskang Lake in Kenora Forest District by Photographer W.T. Masters. On the back cover is the Canada goose found hatching her eggs in May on Toronto Island by T. Jenkins.

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Fishing---Sport or Profit?

Fish are common property, and their management by Fish and Wildlife Branch is guided by the principles of sustained yield, full use, multiple land (water) use, and public use. The realization of these is beset by unique problems.

Most knowledge of the ecology of fishes is recent. Fish live in a medium which man has just begun to enter. Much research is still needed. Why are there year-class failures? How heavily should a species be fished? What irrepairable damage is increasing pollution doing to future fish stocks? Even if these questions were answered, others of a social and economic nature need resolving to achieve best use.

Because of the public-property character of fish resources, government is obliged to make decisions on exploitation. Who and how many will use the resource? What kind of use will be best? These decisions require judgement based on wide understanding. Attempting to obtain the greatest economic return, for example, by leasing a lake or stream to a private or commercial interest, while yielding the most monetary profit, could deprive hundreds of their recreation. Conversely, rigidly applying the idea of "the greatest good to the greatest number" could easily dissipate all economic benefit to the community. Both biologic and socio-economic considerations are needed.

The concept of wise use has tempered some of the original ideas associated with the word, "conservation". Ontario, in applying the "wise use" concept in fisheries management, has actively moved towards multiple utilization by sportsmen as well as by commercial fishermen. In nearly all waters of the Province there is room for both forms of use. Angling and net fishing are complementary rather than conflicting, although some species are wholly reserved for sportsmen and others are taken only by nets. The aims of fisheries management are often advanced when there are both kinds of fishing.

To facilitate dual utilization, impounding nets, which can be operated selectively, are often used, and commercial operations are restricted as to time, area, species, quantity and method. Similarly, anglers are restricted by creel limits, seasons, and fishing techniques, partly based upon biological reasons and partly upon other concepts.

While it has been found, time after time, that competition and over-fishing are more myth than reality, they are concepts difficult to dispel even in the light of scientific evidence. However, in any fishery where it is discovered that competition for the same fish has become sufficiently intense to be harmful to good angling, the commercial fishery is adjusted by application of the restrictive methods mentioned above. The converse has not yet occurred in Ontario. Nevertheless, for over half the world's population, the production of protein is the prime consideration, and any resource utilization decision by these peoples is based upon this premise.



Otter Creek overhead cover maintains cool water in otherwise barren stream.

BROWN TROUT IN SOUTHWESTERN ONTARIO

by W.D. Mansell
Biologist, Lake Huron Forest District
(Photos by the Author)

The brown trout is the most cosmopolitan of all the salmonids that presently exist in Ontario. It is found throughout most of Europe, parts of the Middle East, northern Africa, North and South America, Australia, New Zealand and even parts of Asia. In all of these areas, with the exception of western Europe and the British Isles, this trout is an introduced species.

Introductions of this exotic to eastern North America were made from two strains; the "German" brown was introduced around 1883 to the eastern United States and shortly thereafter, the "Loch Leven" brown was introduced from Scotland to the same area. The first recorded planting in Ontario was made in 1913 when fingerlings were released in the Counties of Wellington, Simcoe, Norfolk and Perth.

Brown trout can be identified readily by two distinguishing features. It differs from brook and lake trouts which have light spots on a dark background by having dark spots on a light background. It differs from rainbow trout, which also has dark spots on a light background, by an absence of radiating spots in the tail fin. Young brown trout are difficult to identify, but characteristically they have a pronounced orange adipose fin and no spots evident in the tail region.

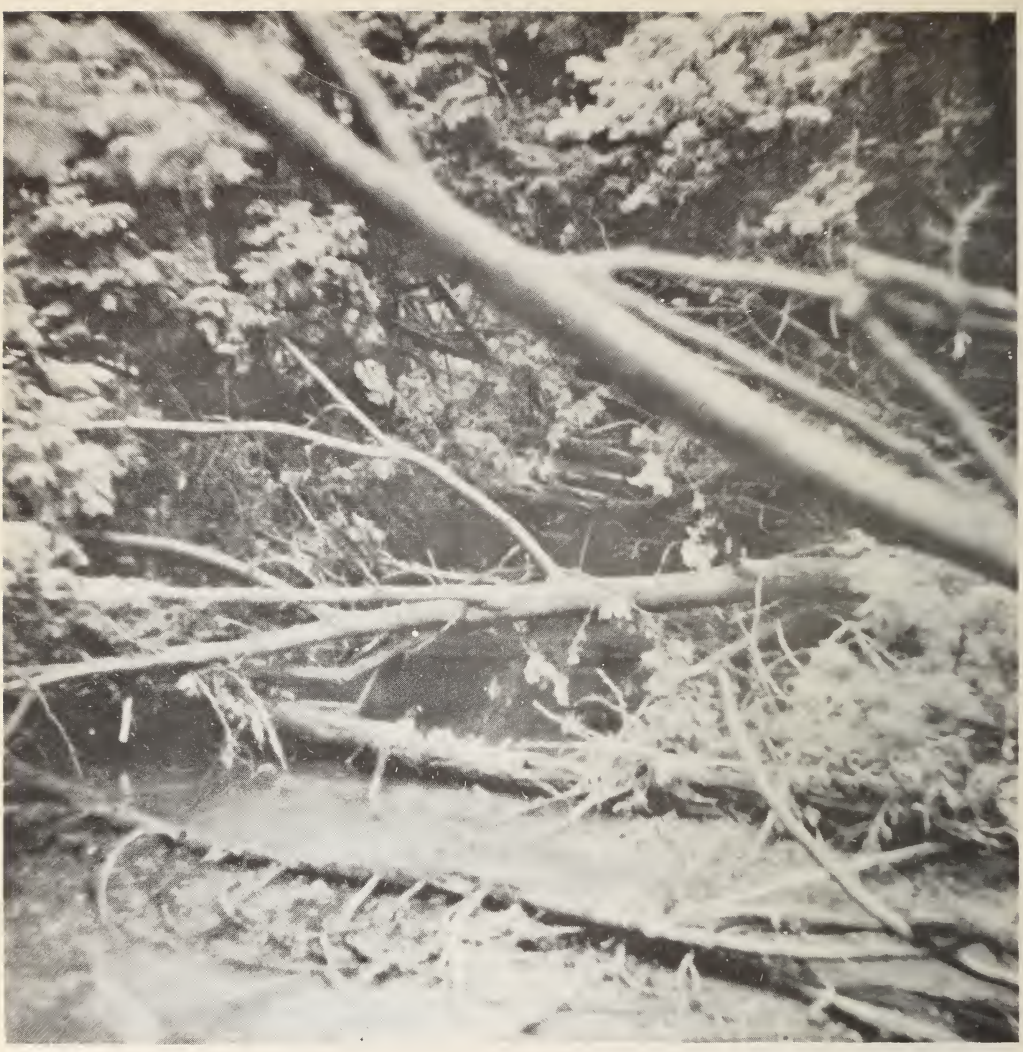
Since both strains of brown trout are able to withstand wide ranges of water temperatures and are extremely competitive, their introductions were often successful.

However, as with many introductions the success of the exotic was at the expense of a native species. In this case, it was the brook or speckled trout. Mason (1961) showed that in a native brook trout population an effort of 100 angling hours yielded sixty brook trout; in a combined population of brook and brown trout, a fishing effort of 100 hours resulted in only thirty trout; and in a brown trout population, alone, the same effort produced only five fish.

Since the Department is attempting to provide the maximum amount of satisfactory recreation to the greatest number of people, it began to examine this problem. It appeared that brown trout, while costing a great deal of time and money to culture artificially, were contributing very little to the fishery while competing with easily creeled and popular brook trout to the latter's detriment. To complicate the picture, brown trout were found to be dormant carriers of the bacterial disease, *furunculosis* which infects brook trout. In view of all the disadvantages of managing brown trout, the hatchery program was discontinued in 1960.

In the following four years, little specific work was done to evaluate the status of brown trout in waters that had been stocked. In 1965, to obtain necessary information on this salmonid (after five years of natural reproduction), a study of brown trout distribution, populations and growth was undertaken in Lake Huron Forest District.

A list of 65 waters, in which brown trout were expected to be present on the



The overhanging cover on Bighead River makes accessibility difficult.

basis of creel census or stocking records, was prepared. Twenty-three streams were sampled using electrofishing gear. Six of these did not reveal brown trout in the areas sampled, while of the seventeen streams in which brown trout were found, there was no documentation of plantings in five. Thus, although these results are preliminary in nature, they suggest brown trout are maintaining themselves adequately. Further investigation of distribution conducted during the current year will provide more reliable information.

Environmental tolerance of the brown trout is less critical in terms of oxygen, temperature and water turbidity than any of the other salmonids. Brynildson et al (1964) stated that the minimum dissolved oxygen tolerated at 68° Fahrenheit is five parts per million. Our summer survey indicates that there is no limitation imposed by dissolved oxygen concentrations in these streams since the minimum readings were 7 parts of oxygen per million at 67°F. The opti-



Five brown trout from Sydenham River, identified by their length in inches: 3.3 young of year; 6.0 yearling; 11.5 two-year-old; 15.5 three-year-old; and 19-inch five-year-old.



Typical brown trout pool on Otter Creek, showing important log cover.

mum temperature for brown trout is between 65° to 75°F. In our test streams, the temperature range was from 53° to 73° F. and never approached the maximum tolerable temperature of 81° F.

Since brown trout can withstand high turbidities for short periods of time, it would appear that they are the most tolerant of the Ontario salmonids in areas of intensive agriculture and where erosion and siltation are usually a problem. These areas usually lack cover, but with their high temperature tolerance, the brown trout alone is capable of existing in sufficient numbers to sustain a fishery.

To determine the present standing population of brown trout, 200-yard sections of each studied stream were marked off. Seine nets were placed at either end of the section to prevent escape of any fish. After capture with electrofishing gear, all trout were finclipped and released as the electric



The shocking procedure on Sydenham River with a freshly taken brown trout.

shocker was worked upstream. This process was repeated until the number of recaptures (fish previpusly fin-clipped) exceeded more than half the total number caught. Besides being clipped, all brown trout were measured, and scale samples were taken to determine growth rates.

During the survey, 565 brown trout and 126 brook trout were examined and liberated. If the calculated densities of fish in the test sections are projected for most typical streams, there would be 1,800 brown trout per mile. This is much less than in some southern United States streams, but is within the density range of between 54 and 4950 brown trout per mile reported for northern Wisconsin streams by Brynildson et al (1964).

The initial growth rates of brown trout in Ontario are less than that reported elsewhere, but their maximum lengths compare favourably. Brown trout here average 2.6 inches at 6 months; 6.5 at one year; 9.8 at two years; 15.3 at three years; and 16.8 inches at four years. Northern Wisconsin brown trout, by comparison, average 4.2 inches at 6 months, but at 41 months attain only 13.0 inches, while ours average 15.3 inches.

Observations during the fall spawning period revealed that redd building activity started about October 15 and continued through early November. Temperatures of the Sydenham River during spawning were between 44° and 48° F.

In the test streams, the majority of trout were taken from log jams or undercut banks where overhead brush contributed additional cover. The destruction of stream banks and reduction of cover were most prominent where cattle pasturing was not restricted to small areas. Obviously, brown trout require good stream cover despite their apparent tolerance of adverse environmental conditions.

One of the major reasons for discontinuing the hatchery culture of brown trout was the low exploitation rate effected by anglers. Being particularly wary, the brown trout can only be creeled by the most skillful anglers. Although it does not put up the spectacular surface display of the rainbow trout, the brown trout offers a challenge second to none. Mason's results suggest a similarity to the low exploitation rate in Michigan reported by Ellis and Gowing (1957). They stated that anglers took 3.0 brook trout for each one remaining at the end of the season but only 0.5 brown trout for each one remaining in the fall.

On the basis of what has been revealed to date about brown trout distribution and exploitation, this wary species is present in substantial numbers and awaits the ardent angler who fishes for the fun and the challenge rather than for a full creel.

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WASTED WATERFOWL

by J. Blair Dawson
Biologist, Game Management Section

Did you ever kill a duck without hitting it? No? Don't bet on it. The lead pellets you sprayed at those fleeing birds last fall may have killed a duck or goose long after you left the marsh. How? Lead poisoning. It may kill as many as two million waterfowl on this continent in some years.

The process starts when a duck or goose accidentally picks up spent shot which is retained in the gizzard along with small stones which are required for grinding food. Unfortunately, the lead is eroded by the grinding process of the gizzard and dissolved by the chemical action of the digestive juices. The lead, in solution, is picked up by the blood stream and causes sickness, often followed by death. Even a single lead pellet can be lethal.

LOSSES THROUGH THE YEARS

Lead poisoning of waterfowl has been recognized for more than a century. In 1842, C.J. Fuchs drew attention to the injury to European waterfowl caused by lead. On this continent, duck losses from lead poisoning have been noted since the late 1800's, and some spectacular die-offs have been reported. One of the worst occurred at Heron Lake, Minnesota, where from ten to twelve thousand ducks died in 1939. In 1948, from two to three thousand mallard died near Grafton, Illinois.

On occasion, heavy losses have been recorded in Ontario. In March 1953, large numbers of canvasback suffered lead poisoning in River Canard Marsh in Essex County. At Pigeon River in Victoria County during the spring of 1955, two thousand bluebill (scaup) were not able to fly or dive, and all birds examined showed evidence of lead poisoning.

In 1962, over one thousand ducks, mainly mallard died on a Manitoba lake. Last spring, more than two thousand Canada geese died from lead poisoning along the Atlantic coast.

Several unique situations have caused problems. In Juneau, Alaska, trap shooting was done over a small pond, and after several years the bottom was literally paved with shot. Ducks were attracted to this particular pond because of gravel deposits not found elsewhere in the vicinity. Since upwards of 50,000 ducks used the area during both spring and fall, two automatic exploders had to be used around the clock to keep the birds away. Closer to home, about one hundred Canada geese fell victim to lead poisoning while grazing clover in a field adjacent to a skeet club near Montreal last spring.

Spectacular losses are only a very small portion of the annual waterfowl mortality caused by lead poisoning. Because sick birds hide themselves in the thickest available cover and are usually picked off quickly by predators, many deaths go unnoticed. In the aggregate, these unnoticed losses are more significant that those which make the headlines.

Waterfowl cover considerable territory in their annual wanderings across



-*Fig. 2. X-Ray plate showing lead pellets in gizzard of a greater scaup.*

the continent, and it takes only one meal in the wrong place to cause trouble. Wrong places are all too abundant. In an average hunting season, six thousand tons of shot are deposited on waterfowl habitat. In 1964, the Michigan Conservation Department reported that the shot in the number of shells used to take 1,136 geese and 200 ducks on one shooting area added up to nearly four tons of lead! The practice of illegal baiting is particularly diabolical when it places food in areas where lead may have been deposited for many years. Some blind sites in Maryland, for instance, have been gunned over for nearly two hundred years.

Birds affected by lead poisoning often undergo a lingering death. One of the effects of digested lead is to greatly reduce appetite. Droppings are greenish in colour, and birds show weakness and fatigue and become very emaciated. In dead birds, muscles are wasted away while the livers and kidneys are much reduced in size. A green or dark brown stain generally colours both the lining and the contents of the gizzard.

Because feeding traits and habitats differ, not all waterfowl are equally vulnerable. Baldpate and gadwall swallow few shot because they feed on leafy plants rather than seeds on the bottom. Shoveler and green-winged teal skim the surface for their food rather than puddle in bottom silts. Dabblers, such as mallard, black and pintail, are more susceptible since they probe six inches or more in the bottom sediments for food. Divers, including canvasback, redhead and ring-necked ducks which usually dig for seeds and aquatic tubers, are particularly vulnerable.

Figure 1 shows the percentages of various species in a sample of over 18,000 ducks which held one or more lead pellets in their gizzards. Of the 957 gizzards which contained lead pellets, 69% had one pellet; 13%, two; 6%, three; and 12%, four pellets or more. Experiments indicate that ingestion of one pellet fortunately does not cause high mortality.

A method of determining the incidence of lead shot in waterfowl is by X-ray or fluoroscopy. During banding operations, trapped birds are examined fluoroscopically, and the location of lead shot in the digestive tract is observed. Figure 2 is an X-ray plate showing pellets in the gizzard of a duck.

The diet is an important influence in lead-poisoned birds. Experiments with captive ducks show that most pronouced effects occurred in birds fed whole corn. Effects of poisoning were reduced in birds fed smaller seeds and particularly if green parts of aquatic plants were added to the diet.

Recovery from lead poisoning depends upon the natural passage of shot from the gizzard and sufficient food intake to replace the high weight losses. Reduced food supplies in winter and early spring may prevent many birds from recovering and at these times heaviest losses are observed. Since affected birds are more vulnerable to the gun, few sick ducks are recognized during the hunting season.

Man is not affected by eating ducks poisoned by lead. Most of the lead is concentrated in the liver and kidney which are rarely eaten. Tests show that the livers of poisoned ducks contained amounts of lead of little significance to human beings.

WHAT CAN BE DONE?

For many years, conservationists have discussed ways and means of re-



Some popular duck hunting areas have been gunned over for more than two centuries. The chances are that the bottom is paved with lead shot.

ducing the number of waterfowl wasted by lead poisoning. The simplest method seems to be the replacement of lead in commercial shot pellets with a non-toxic metal. In the late Forties and early Fifties, the Olin-Mathieson Corporation of East Alton, Illinois, was responsible for pioneer research in this field. The firm patented a process for producing "soft iron" shot, but economic considerations and a general rise in the continental waterfowl population in the mid 1950's resulted in the postponement of further research.

The recent decline in waterfowl numbers (coupled with the increasing lead poisoning problem) have again stimulated both government and industry to seek a solution to the problem. Several of the large sporting arms and ammunition companies, the U.S. Fish and Wildlife Service, and members of International waterfowl flyway councils are cooperating in an all-out attack.

Currently, two approaches to the problem are receiving the greatest at-



Hunters can reduce lead poisoning by shooting only at birds within range.

tention. One is the search for non-toxic shot metals; the other is the search for alloys of lead which would disintegrate rapidly in water before damaging waterfowl. The U.S. Fish and Wildlife Service at its laboratory in Patuxent Maryland is testing various elements which, combined with lead, will hasten the breakdown of commerical shot. As yet, no major break-through has occurred.

In the search for lead substitutes, many non-toxic metals have been considered but they are less dense than lead and most have inferior ballistic characteristics. Their costs are usually higher. The most promising substitute appears to be iron, and much effort is currently directed toward the perfection of iron shot. Iron is cheaper and more abundant than lead. The Olin Company has patented a process of softening iron to reduce damage to gun barrels. This process is expensive and requires special facilities, but the shot does not sufficiently reduce barrel wear.

Unsoftened iron may be the answer

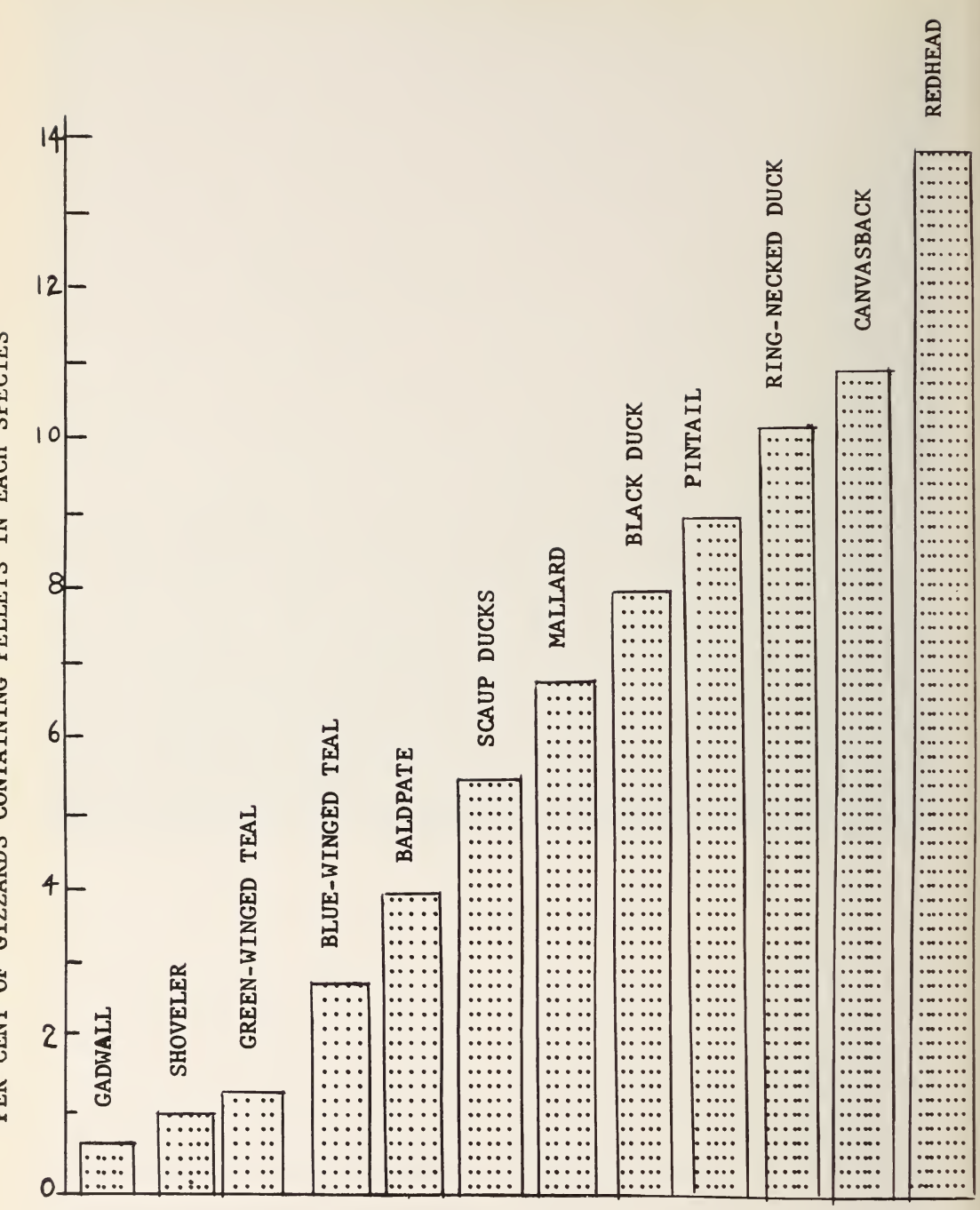


Fig. 1. Occurrence of commercial shot pellets in the gizzards of 18,454 ducks of various species. The gizzards were collected in recent years from many parts of the United States in autumn and early winter. (From LEAD POISONING IN WILD WATER-FOWL, Jordan and Bellrose, 1951).

if a protective coating or lubricant can be placed around each pellet. Teflon, the "anti-stick" covering used on frying pans, is being tested and shows promise. Plastic sleeves or inserts which prevent the iron shot from scoring gun barrels may be effective and could be combined with shot coverings or lubricants. Recent attempts to coat lead shot with tin plating or an organic resin coating met with unsatisfactory results. Both methods failed to lower toxicity to ducks sufficiently.

Last year, a field test of iron shot was carried out by personnel of the U.S. Fish and Wildlife Service and wildlife specialists of the Mississippi Flyway Council at Nilo Farms, a research and public shooting preserve owned by the Olin Company. Tests were run on a standard shooting preserve layout where pass-shooting is done on fast-flying mallards. Birds are released on a hilltop and head for a pond located in the valley some distance below. Some interesting facts were learned. Iron compared very favourably with lead; average killing distance was 30.8 yards with lead and 31.9 yards with iron. Of the fifty three ducks crippled, 72% were hit with lead shot and 28% with iron. Iron shot caused considerable external damage to the ducks and produced much more hemorrhaging. Waterfowl experts were enthused over the lower crippling losses caused by iron shot. The lower-density iron decelerates more rapidly and loses its effectiveness at ranges over forty yards as compared to about fifty yards for lead. Since over *one duck in four* now is crippled and lost, mainly by out of range "sky-busters", the perfection of iron shot would produce dual benefits in the sport of waterfowling.

The problem of barrel wear caused by iron shot must be overcome. Following this, legislation prohibiting the use of lead shot for waterfowl hunting would be required. If manufacturing costs are increased, hunters should be prepared for some additional expense in the interest of improving their sport.

It may be some years before the lead poisoning problem is solved. Until then, all hunters can help reduce waterfowl losses. How? By shooting only at birds within range. This will reduce the needless deposition of expended pellets and will significantly lower the crippling loss as well. When is a duck within range? Try setting out a twenty-inch-square piece of paper and view it down your gun barrel at distances of between thirty and fifty yards. Vulnerable spots for most ducks in flight are contained within this area. The relationship between your gun muzzle and a flying duck can be worked out in jig time. If you are a double twelve man and the muzzle of your gun completely covers a black or mallard, don't shoot—he's too far out!

With decreasing habitat and a growing number of hunters afield, ducks need as much help as they can get. You'll be giving them a boost if you look twice before pulling the trigger this fall.

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Musky fingerlings are distributed when from seven to ten weeks of age.



At planting time, musky fingerlings average five inches in length.

MILES 'N MILES OF MUSKY

by J.M. Hunt
Manager, Deer Lake Fish Hatchery, Lindsay Forest District
(Photos by Henry Lore, Waterloo University College)

The Deer Lake Maskinonge Hatchery is located on the Crowe River at the outlet of Cordova (Deer) Lake in Belmont Township, Peterborough County, a pleasant twelve-mile drive from the village of Havelock on No. 7 Highway. It is near the site of an old hydro and compressed air plant that was in operation during the early 1900's to supply the nearby Cordova gold mines with electric power and compressed air. In fact, the hatchery is using the same old rock cut for its pipeline to supply gravity-fed water to the ponds and buildings.

Operations at Deer Lake began in 1940 and, since then, millions of maskinonge have been produced for Ontario waters. Much of the operation, such as the artificial spawning of parent stock, fertilization of eggs and the hatching and rearing processes, takes place in the early spring. Consequently, summer visitors will see only the terminal, fish cultural activity: that of raising the maskinonge to the fingerling stage.

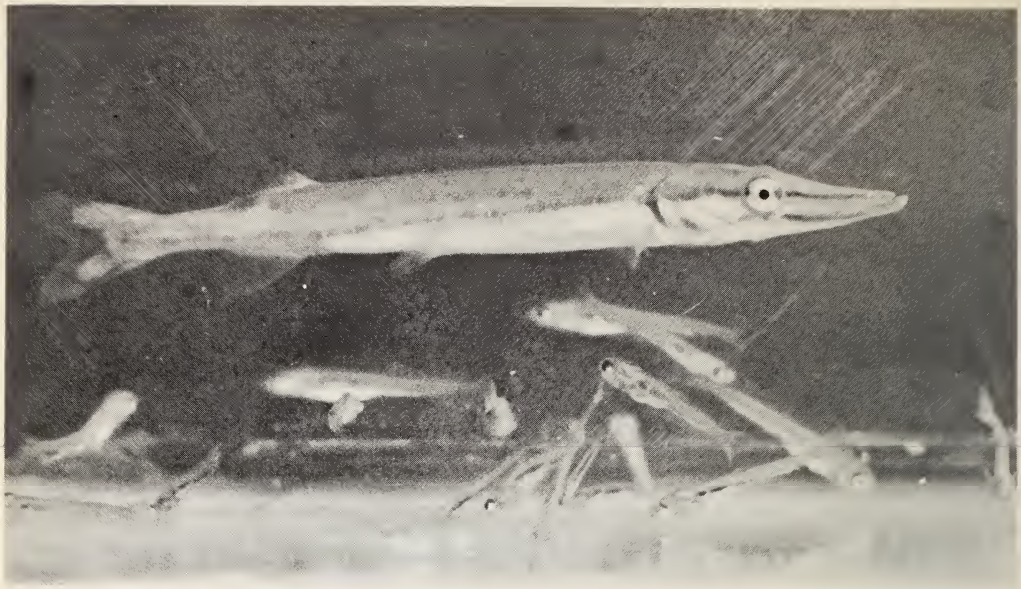
In eastern Ontario, this prized game fish spawns in shallow, weedy bays in late April or early May. The eggs hatch in about 15 days, and the newly-hatched fry lie semi-dormant for another 10 days absorbing their yolk sacs. Due to changing water levels, the spawning areas may sometimes be left high and dry resulting in the destruction of millions of eggs and young fry. One function of the hatchery is to compensate for such losses. Another is to provide fish for introductions into suitable waters not inhabited by this species.

Maskinonge eggs and milt are stripped from parent fish which are netted in Buckhorn and Stony Lakes. The fertilized eggs are transported immediately to the hatchery about fifty miles away. A large female maskinonge is capable of providing roughly two quarts or 120,000 eggs. Between three and four million eggs are cultured at the hatchery every year.

Upon arrival at the hatchery, the eggs are placed in six-quart hatching jars, two quarts to the jar. Fresh water is circulated through the eggs. Periodically, they are stirred gently with a long feather, and dead and broken eggs are siphoned off and discarded. Hatching occurs in 15 days, more or less, dependent upon water temperatures. The yolk sac fry are then transferred to trays in the rearing troughs and held until they reach the "swim-up" stage, usually in 10 days.

At this point, most of the stock is distributed, some two to three million fry being planted in suitable Ontario waters. The bulk of the stock is planted in the Kawartha-Trent region with the source waters of the egg supply receiving a larger portion. Every year, 300,000 fry are reserved for rearing to the fingerling stage in outdoor ponds at the hatchery.

These ponds, which have been drained, cleaned and refilled by the time the eggs have arrived for culture, are fertilized with soy bean meal which stimulates the growth and production



Young maskinonge at Deer Lake hatchery feed voraciously: first, on animal plankton; next, on sucker fry; finally, on minnows and each other.

of vegetable plankton (phytoplankton). These microscopic plants serve as food for animal plankton (zooplankton) which in turn are eaten voraciously by the half-inch maskinonge fry for about three weeks. By the time they reach an average length of one inch, they are ready to feed on sucker fry which have been hatched out concurrently. In recent years, about ten million sucker fry have been provided as forage but, with the young maskinonge so hungry, they are devoured within a week or so. Incidentally, sucker eggs from the immediate area hatch out too early to be of much use as food for the maskinonge fry. Later-hatching sucker eggs, collected in the Port Arthur Forest District, have been found to be eminently suitable.

When the sucker fry have been consumed, live minnows are seined by the staff in local lakes and are hauled to the hatchery in large water tanks equipped with oxygen. For the next five or six weeks, seined minnows are the sole food of the young maskinonge. Thus, the wild minnow hatch looms large in the culture of maskinonge. If that hatch is poor, then the men must range farther afield to collect enough, but even with a herculean effort there is difficulty in keeping the maskinonge appetities satiated. Cannibalism, always a threat among maskinonge, starts as soon as food supplies dwindle.

Distribution of the fingerling stock begins when maskinonge have reached four inches in size (at about seven weeks) and continues until they are six inches in length (10 weeks). About 50 to 60 Ontario lakes are stocked with the 30,000 fingerlings which have been produced from the original 300,000 fry.

From 1948 to 1965, the Deer Lake Fish Hatchery collected 84,485,000 maskinonge eggs, and planted 53,387,000 fry and 696,688 fingerlings. With fry averaging less than an inch and fingerlings five inches at planting, the hatchery has produced 555 miles of maskinonge ---- quite a fish to feed!

CHEAPER BY THE BAG

by W.A. Hooper
Fish Culturist (Tarentorus), Sault Ste. Marie Forest District
(Photos by E. Hay)

Fish culturists in Ontario are constantly exploring ways to improve the techniques used in the production and planting of fish. One phase of the operation which has been under close scrutiny is the transportation and planting of fish stocks, especially by aircraft. Increasing the efficiency of stocking at a reduced cost is one primary objective.

Ideally, trout should be planted in early spring while the temperature of the water in the lakes and rivers is as close to that of the hatchery water supply as possible. This reduces one important stress on the fish. Also, with the young fingerlings growing rapidly, the hatchery is pressed for space until the yearlings are stocked. Furthermore, as the fire hazard increases in the spring, the demand for aircraft becomes more acute. For these reasons, there is a need to speed up the aircraft planting of trout.

For over a decade, plastic bags have been used successfully for transporting fish by bait dealers and tropical fish importers. In 1955, tropical fish were shipped from the Mexican mainland to Tijuana and, in another instance, from San Diego to Ann Arbor with a maximum time lapse of 48 hours, (Miller, 1956). In Ontario, experiments were carried out at the Hill Lake and Petawawa Trout Rearing Stations during 1959 and 1960. Observations were made on the behaviour and reaction of trout to the closed environment of plastic bags to determine the numbers of fish which could be carried for periods of eight to 48 hours.

The plastic bag method for transport was successfully employed in 1963 when 106,700 lake trout yearlings were moved from Charlevoix, Michigan, to the Glenora Fisheries Research Station, (Christie, 1963). Subsequently, tests were conducted at the Tarentorus Trout Rearing Station to determine the feasibility of incorporating this method in the Sault Ste. Marie District fish planting program. Special emphasis was placed on determining the number of trout which could be safely held in a plastic bag for three hours, which is the maximum time required for any planting in the District.

The conventional trays, tanks and aerators, presently used in Ontario aircraft, limit the number of fish carried. The weight and size of this equipment, combined with the large volume of water required, reduced the "fish-load" to only 12 per cent of the total. The use of light plastic bags eliminates the heavy equipment and most of the water, leaving room for more fish.

To establish the proper ratio of fish to water in the bags, 15 pounds of chilled water and varying amounts of fish were weighed in a tub and emptied into a 4 mil plastic bag, 22 inches by 36 inches. Air, forced out by collapsing the bag, was replaced by pure oxygen. The bag was then sealed with two heavy rubber rings and placed horizontally in a cardboard box to ensure maximum surface area between water and oxygen. It was found that 12 pounds of fish could be carried suc-



D. V. Storms, Manager of Tarentorus Trout Rearing Station, pours 23.5 pounds of chilled water into a tub. Assistant Manager G.A. Clark stands by to add 16.5 pounds of brook trout. The tub is emptied into a plastic bag.

cessfully in 15 pounds of water for three and one-half hours.

It is known that chilling the water slows down fish activity by acting somewhat like an anaesthetic. This reduces excitability and lessens the build-up of noxious substances produced by the respiratory and excretory processes of the fish. Both factors are important in the survival of planted brook trout.

Two test plantings were made in the fall of 1965. Underwater observations of a diver revealed excellent survival. This method was tested on a large scale in 1966. Assembly line methods were used to cut down bagging and packing time. The boxes of plastic bags, each containing 500 fish, were placed in the aircraft. Before the drop zone was reached, bags containing the required number of fish were emptied into a large funnel (sealed with a plunger) in the floor of the aircraft. Over the lake to be planted, the plunger



Plastic bag, holding 500 yearlings, ready for shipment in styrofoam container.



After the air is pressed out, the plastic bag is inflated with oxygen.

was pulled, releasing the fish.

By the plastic bag method, 111,600 brook trout were planted in 11 hours and 30 minutes flying time. The cost of aircraft time alone is $6.71 a thousand as compared with $29.10 per thousand fish using conventional trays. This was mainly due to the increase in carrying capacity from 7,200 brook trout per load to 20,000.

Air Service pilots involved in this operation cited other advantages: fewer trips; faster loading of aircraft; faster loading of funnel; reduced fish loss; less water spillage; and no loss of stability due to movement of water in tanks.

From the pilot's viewpoint, the aircraft is not temporarily incapacitated through being loaded with tanks, oxygen bottles and water tubing.

There are several minor problems which were encountered with the carrying containers, but these can be corrected by continued experimentation. Follow-up surveys are planned for a number of lakes planted in this manner. If results are as favourable as indicated, this will be by far the most practical and economical method of transfer of brook trout. This will not only be an aid to Department personnel but also will be a boon to the taxpayer and to the angler.

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On Sunset Lake, brook trout opening day belongs to the ice fisherman.



Snow vehicles reach isolated lakes where brook trout used to die of old age.

WHY NOT FISH BROOK TROUT IN THE WINTERTIME?

by C.E. Monk
Fisheries Management Officer, Port Arthur Forest District
(Photos by C.A. Elsey)

A half century ago this past June, an angler cast a fly into the swirling waters of Virgin Falls in the Nipigon River. A ravenous fish of delicate blue sheen, dotted with iridescent red halos, snapped up that fly. It thrashed and churned the waters for a solid hour before it was landed. It was a brook trout *(Salvelinus fontinalis)*. Precisely, it was *the* brook trout.

The angler was the late Dr. J.W. Cook of Fort William, Ontario, and he had just landed the world's record brook trout. It weighed 14 pounds, 8 ounces. That record still stands. The specimen, or at least what is left of it, is still on display at the Tourist Information Centre in Fort William.

What happened that June day fifty years ago was a good deal more than just the catching of a large brook trout. It was a dream come true–and more. That fish stood for all the superlatives befitting such an achievement. It put the Nipigon River on the map of the world, and ushered in an era. At that precise moment, the great fraternity of fly fishing experts attained a summit. Their sun never stood higher.

Ever since, the Canadian Lakehead has housed its share of this great cult. They fidgeted away the winters tying flies, patching waders or swapping yarns. Calenders in their homes and offices alike displayed a circle around the brook trout opening date. That opening day usually occurred around the first of May. It catered to the fly fishermen–it cultivated the purist–and it satisfied the appetite nurtured by the long Canadian winter. In a sense, most open water brook trout anglers are dedicated sportsmen with strong ethics. They believe that a brook trout should be angled during open water, taken on a lure or a fly and permitted to fight for its life. Their sun, however, may be about to set.

This year, February 26th was opening day for much of the Province's brook trout waters. It wrote *finis* to the old accepted romance associated with previous warm-weather opening days. It ended the era of the pleasant traditions of the brook trout purists. They still exist though, and enjoy fly fishing and open water angling, but the razor-edge excitement of opening day is gone. Brook trout opening now belongs to a new breed–the ice fishermen.

And it was tailor-made for him. He had all the equipment: insulated underwear and boots, ice chisels or power augers, hand lines and tip-ups, snow toboggans or snowhoes..... Moreover, he was already there. Ice fishing has been growing in popularity in Ontario for more than a decade. It is only logical that brook trout should be added to the creel.

Time was, not long ago, when some brook trout in isolated lakes grew fat and lazy and died of old age without ever seeing a hook. Many of these lakes, too small for aircraft and too far to reach by a reasonable portage, seldom saw an angler. Not so today–

the snow toboggan has literally annihilated the distance to remote lakes, and put an exclamation mark after the word accessible. This toboggan follows almost any trail in the bush. It is portable and fast. Lakehead anglers now team up and travel in groups, using two or more snow toboggans in case of breakdowns.

Unknown Lake, located several miles north of the Department's Dorion Fish Hatchery, provides a good example. It was considered good for brook trout, but it was hard to get at and rarely fished. Last winter that was changed. Snow toboggans beat a path twelve miles through typical Ontario bush to its shores. Anglers pounded holes through three feet of snow, slush and ice. They set their tip-ups and baited their hooks with minnows. Brook trout opening day had a new meaning—a different atmosphere. A campfire was quickly built right on the ice (no danger of forest fires) and coffee was soon bubbling in a tin pail. The frying pan waited for the first brook trout.

Ten of those anglers were interviewed on their return that opening weekend. Their remarks are worthy of mention: "Boy, that's really livin'!" "This beats the black fly fishing all to hell!" "We cooked part of 'em right on the lake -- they never tasted better!" *They had caught 10 brook trout altogether averaging between two and three pounds apiece.* "This fresh air is a real winter tonic!" *The fresh air was nearly 20 below zero.* "I hope you can have it open every winter like this!" The same enthusiasm was encountered at other lakes around the Lakehead.

Contrary to popular belief, brook trout do not usually bite well in the dead of winter. Conservation Officers observed that angling success began to pick up towards the end of March and early April. Probably as the days grow longer and the weather becomes warmer, there is a tendency for anglers to work the lines more often. Brook trout fishermen checked this past winter seldom had their legal limit, but usually one or two fish each. Morning and evening were considered the best times to fish, with the accent on the morning. Sunny, bright days seemed to produce better results than cloudy, dull days.

Open water finally came to the Lakehead area during the week of May 22nd. The time-honoured pilgrimage to our lakes and rivers followed that break-up – but the old fascination was not there. After all, the brook trout season had been open for nearly three months. Some subtle psychological change had occurred; a certain hollowness prevailed. The great fraternity had not adapted to the new brook trout opening, and it may be another generation before they do.

There are many reasons why brook trout should be angled during the winter. Brook trout waters should contribute the most good to the most people for the longest period of time, without jeopardy to the resource. Perhaps the motive goes deeper and touches on the Canadian character. Bruce Hutchinson* discusses the Canadian personality as follows: ". . . And we are a lonely people, . . . Lonely, and awed by the cold sweep of the prairies, . . . and by the fierce northern climate, which colours and toughens the weather of our spirit . . .

This deep instinct for the land, our constant feeling of struggle against

** "The Canadian Personality" by Bruce Hutchinson (Longmans, Green and Company) was originally given as a radio talk over C.B.C., September 1st, 1948.*

a harsh nature --- this and our concentration on the mere task of survival . . ."

Perhaps winter angling for brook trout is a natural Canadian expression?

Popular brook trout angling usually requires, among other things, reasonably easy access to the fishing area. For the winter angler at least, motorized snow vehicles have provided the means.

Open water versus winter brook trout angling touches upon the code of sportsmen's ethics – that old unanswerable question – which has enlivened many a heated discussion. Perhaps, winter angling for brook trout is only a preliminary sketch towards the development of a new code of ethics. Perhaps, fishing brook trout during the winter, the price for a new fraternity, is not too high.



Ice fishing has been growing in popularity in Ontario for more than a decade.

